principle as directed to one definite character alone. Individual selection must, however, step in from time to time, to check the other process when this latter exceeds the demands of utility. This is how so many different modifications can be set going at the same time. It is to be observed that qualitative no less than quantitative modification must be under the influence of the same principle. Selection must affect the "biophors" as much as the "determinants" which they compose. A *quantitative* alteration of constituent biophors appears to us as a *qualitative* modification of the corresponding determinants, and this enables us to understand how "units of variation" may play their part by either simultaneous or independent modification, as on the under side of a butterfly's hind wing. The phenomena of mimicry cannot be accounted for by accidental variations only, but must depend on variation definitely directed by utility. It is to be observed that the determinants and groups of determinants here postulated have nothing to do with Bonnet's preformation theory. The determination of the character of a developing ovum by its own constitution, instead of by the action of external forces, must be admitted by all those who do not, like O. Hertwig, confound the conditions of development with its causes.

The assumption seems inevitable that every heritable and independent variation in the soma depends on the variation of a definite part of the germ; not, as Spencer thinks, on that of *all* the units of the germ. The latter theory leads to needless complication. It is no valid objection to the determinant theory that it deals with invisible elements. The same is true of the chemical assumption of atoms and molecules. The theory justifies itself as such in that it can be used as a formula, to express, for example, the conditions of di- and poly-morphism. The "Hotspurs of biology" forget that all our knowledge is provisional. The assumption of biophors and determinants is parallel to such conceptions as "force," "atoms," and "ether-waves" in the domain of physics.

Epigenesis does not, as has been held, allow a simpler structure for the germ than the counter-theory, and germinal selection explains entirely the direction of variation by utility. It also disposes of the objection that selection cannot cause the variations with which it works. Given the numerical fluctuation of the units, selection will do the rest. Hence both the exactitude and simultaneity of useful variations, a simultaneity which may affect like parts, as in the development of eyes and limbs; or unlike, as in the production of complex mimetic patterns. The principle of selection reaches just so far as utility reaches, and translates, as we have seen, quantitative into qualitative modifications. Utility undoubtedly goes hand in hand with modification, but the dwindling of disused parts shows that the inheritance of characters actively acquired does not cover the whole ground, as the selection theory does; for how can the *disuse* of an organ affect the germ? The Lamarckians are right in pronouncing individual selection inadequate to account for the facts, and also in denying that panmixia could bring about the entire disappearance of a disused organ; they err, however, in attributing the results of Roux's "struggle of parts" to heredity.

Thus then the three stages of selection are (1) personal or individual (that of Darwin and Wallace); (2) histological, as maintained by Roux; and (3) germinal, as pointed out by Weismann. There is indeed another stage, that namely between races or stocks. Here individuals play the same part as organs in individual selection; the analogy, however, is not in all respects complete.

Everything in nature, says the author in conclusion, is purposeful; and this fact can only be accounted for by the theory of selection. What is obscure in the process is so from the imperfection of our methods, not of the principle. All kinds of knowledge ultimately resolve themselves into the hypothetical and unknowable. But doubt is the parent of progress; the veil is raised little by little; and what still remains dark in the explanation points, like the magic wand in the hands of the water-finder, to the hidden springs of truth, ready to yield themselves up to the persevering seeker.

The preface contains a forcible and dignified vindication of the use of hypothesis in scientific investigation; both generally and with special reference to the author's own theory of heredity. Appendices are added, in which several points raised by the paper receive more detailed treatment. The controversies that have centred round Prof. Weismann's former works are not likely to be hushed by the present treatise. We may safely venture to predict that the olive-branch held out to the neo-Lamarckians (p. 59) will not be accepted, though the admissions as to the inadequacy of individual selection will be welcomed by many as evidence of a change of view. The absence of all reference to amphimixis no doubt simplifies the argument greatly; it will, however, be probably used in some quarters to point the moral of the author's inconsistency. But, whatever the amount of acceptance which this latest development of the selection-hypothesis is destined to achieve, there can be no question that the present will rank among the most interesting and suggestive of the Freiburg professor's contributions to biological theory.

F. A. DIXEY.

[ADDENDUM.—Since the above notice was written, an English translation of Prof. Weismann's treatise has been issued by the Open Court Publishing Company, Chicago.—F. A. D.]

RIVERSIDE LETTERS.

Riverside Letters; a continuation of "Letters to Marco." By George D. Leslie, R.A., author of "Our River." Pp. xvi + 251. (London: Macmillan and Co., Ltd., 1896.)

ALTHOUGH in his preface Mr. Leslie is careful to state that he cannot assert in the case of these Letters, as he did in the previous volume of his "Letters to Marco," that they were written wholly without view to publication, yet is there little or no change in subject-matter or in style. They are, like the former collection, genuine letters sent to his friend Mr. Marks, R.A., and the topics on which he writes are of mutual interest to the two friends who both, as he says, "love nature for her own sake, untrammelled by the prepossessions that not unfrequently accompany that love among the votaries of science or sport," and in publishing them he doubtless

© 1896 Nature Publishing Group

hopes to find like sympathetic readers among the many who share that love with the two Royal Academicians. Nor do we think he hopes in vain. Admirers of nature are a companionable folk; they love to compare notes, to be asked to share each other's triumphs, to admire each other's finds, and among the topics on which Mr. Leslie dilates are many in which they will find an interest. They will be ready with their tribute of admiration for his *Iris susiana* and his *Cipripedium spectabile* (diverse triumphs), with their sympathetic sorrow at the loss of his old and faithful donkey, and will appreciate his avowal of the inexpressible pleasure he felt at the casual discovery of the exquisitely coloured berry of the lily of the valley. "You will, I dare say, laugh at me for my sentimentality," he writes. We cannot believe that his correspondent did, nor will the appreciative reader. It is the spirit of the true lover of nature, to whom such sights, the more that they come unexpectedly, can ever "bring thoughts that do lie too deep for tears."

Mr. Leslie confesses to a life-long fondness for gardening. He tells us that he had known the Jew's Mallow for more than fifty years before he learnt its botanical name of *Kerria japonica.* We doubt if he is happier for the knowledge. We, for our part, love to think of these old favourite flowers by their nicknames, so to speak, and not by the mongrel Latin names of the florists' catalogues. Among plants, as among men, the possession of a nickname is a sign of popularity, and it is the tender old-world associations that linger round them that give such a charm to some mere list of flowers in the poetry of the Elizabethan age. As regards the name of "Jew's Mallow," which, by the way, belongs to the rather numerous class of plants that cottagers seem to grow better than any one else, Mr. Leslie gives an explanation which is new to us. and which, though doubtless a true one, is far less interesting or suggestive than many a one which our imagination has tried to frame. While on the subject of names, surely Mr. Leslie is wrong in blaming (p. 75) English rose-growers for giving French names to the roses they introduce. In a list of more than 170 kinds we cannot find one case of such unpatriotic conduct, while such well-known instances as Captain Christy, Hon. Edith Gifford, and W. A. Richardson seem to point the other way.

The even tenor of Mr. Leslie's narrative is interrupted by two important events—the great flood of November 1894, and the long frost of the early part of 1895, from both of which visitations he escaped comparatively unscathed. In the case of the latter, he attributes his immunity to having such hardy and well-established plants in his garden; while in the former, the porous subsoil, chiefly gravel and sand, seems to have allowed the water to drain away, leaving only a little mud behind. We wonder, by the way, that Mr. Leslie found no fish stranded after the water subsided. We saw on that occasion hundreds of little ones, chiefly baby roach, left lamenting in a meadow near Marlow. But light as the visitation was, those who feel inclined to envy him the facilities to which he owes his Buck Bean and *Cipripedium spectabile*, will perhaps find some consolation in the sketch of his lawn tennis court on November 19, 1894, which, as he says, "was covered by four feet of water, and formed a lovely calm pool to boat on. I took the opportunity in my boat, of clipping the top of a hedge, which was rather too high to reach under ordinary circumstances." A quaint touch.

Like a true gardener, Mr. Leslie has his gird at the weather, anent the disastrous May frosts of two successive years, and at the devastating efforts of his paid staff, a gardener and a boy, in their attempts to help in the flower garden. In this we cordially sympathise with him. Work among the cabbages and potatoes seems to induce in the former official a breadth of handling quite inconsistent with the delicate stippling (we trust we do not misuse these technical terms) appropriate to the flower garden, while there is no weed, not even couch-grass or bindweed itself, that we would not rather see in our borders than "a boy" with a hoe.

With the many other topics touched upon by Mr. Leslie, we have here no space to deal. The book is pleasantly illustrated with drawings by the author. In the sketch of the Nuthatch, we cannot think that he is represented quite stoutly enough built. We have very frequent opportunities of seeing one at his work, and have been much struck not less with the great development of the muscles of his neck, than with the evident force with which he uses them, which latter is admirably indicated in this drawing.

To conclude, Mr. Leslie's book is not, and does not pretend to be, scientific or exhaustive, but it is eminently readable; and those whose lighter occupations lead them to find interest in the same field as Mr. Leslie, will derive much pleasure from the congenial gossip of "Riverside Letters."

MAN AND NATURE IN FINMARK.

Folk og Natur i Finmarken. By Hans Reusch, Ph.D. Pp. 176. 32 Illustrations. (Kristiania: T. O. Brögger, 1895.)

THE district treated of in this volume is one to which, at the present moment, the eyes of the astronomical world are turned with lively interest; for within its bleak borders the approaching eclipse of the sun will be observed if the atmospheric conditions be favourable. To astronomers, therefore, this book will be specially interesting and opportune; and not to them alone, but to every traveller who has visited the far north of Norway and sought the midnight sun, and even to the still more numerous class who are compelled to content themselves with acquiring a knowledge of lands and peoples solely from books. It is a model of what a book of travel should be; all insignificant details are ignored, but we have the observations and suggestions of one of the shrewdest of observers. Dr. Reusch is deeply interested in the commercial progress and social welfare of his fellow countrymen, and his book is full of valuable suggestions for the advancement of both; while at the same time he is not only just, but very generous in the views he expresses about other races, especially in regard to the Russians, whose territory forms the eastern boundary of Finmark. He describes in graphic and, at times, eloquent language the physical and geological features of the desolate interior of this northern province, which lies far within the Arctic circle, its storm-beaten coasts and its inhospitable, silent, stony deserts, where no tree will

© 1896 Nature Publishing Group